Fermi
national accelerator laboratory

EXP-72
March 7, 1975

ACCELERATOR EXPERIMENT--Calibration of the D0 Abort Beam Loss Monitor

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DATE PERFORMED: 19 February 1975

The D0 Abort Beam Loss Monitor was calibrated against the Main Ring Intensity Monitor as the accelerated beam was aborted at various intensities at energies of 100, 200, 300 and 380 GeV. The total losses at C0 were also recorded. Main ring intensity was varied from 0.1 $(10)^{13}$ to > $(10)^{13}$ protons by controlling the number of booster batches and the number of booster turns.

Graph 1 shows the plots of the D0 abort monitor as a function of main ring intensity at each of the above energies. Across the top of the graph is indicated the corresponding number of booster batches and booster turns. A slight nonlinearity is present particularly at 380 GeV. This nonlinearity could result from one or more of the following:

1. The loss monitor is saturating.
2. The main ring intensity monitor is nonlinear.
3. As intensity and energy increase, a small fraction of the beam is deposited elsewhere.

The first reason listed is of course a possibility, but the proximity of the loss monitor to the abort system and the level of the signals observed suggest not.

It is also doubtful that the main ring intensity monitor is nonlinear as the extraction SEM tracks well the main ring intensity over the range of intensities used here.

The latter reason is a possibility but time did not permit pursuing the question. The total loss at C0 (injection plus extraction) was observed to increase nonlinearly with intensity as indicated in graph 2; nevertheless, the maximum observed loss was smaller than target-out operation during routine accelerator

operation. It was also noted later that the extraction octupole had inadvertently been on at 380 GeV.

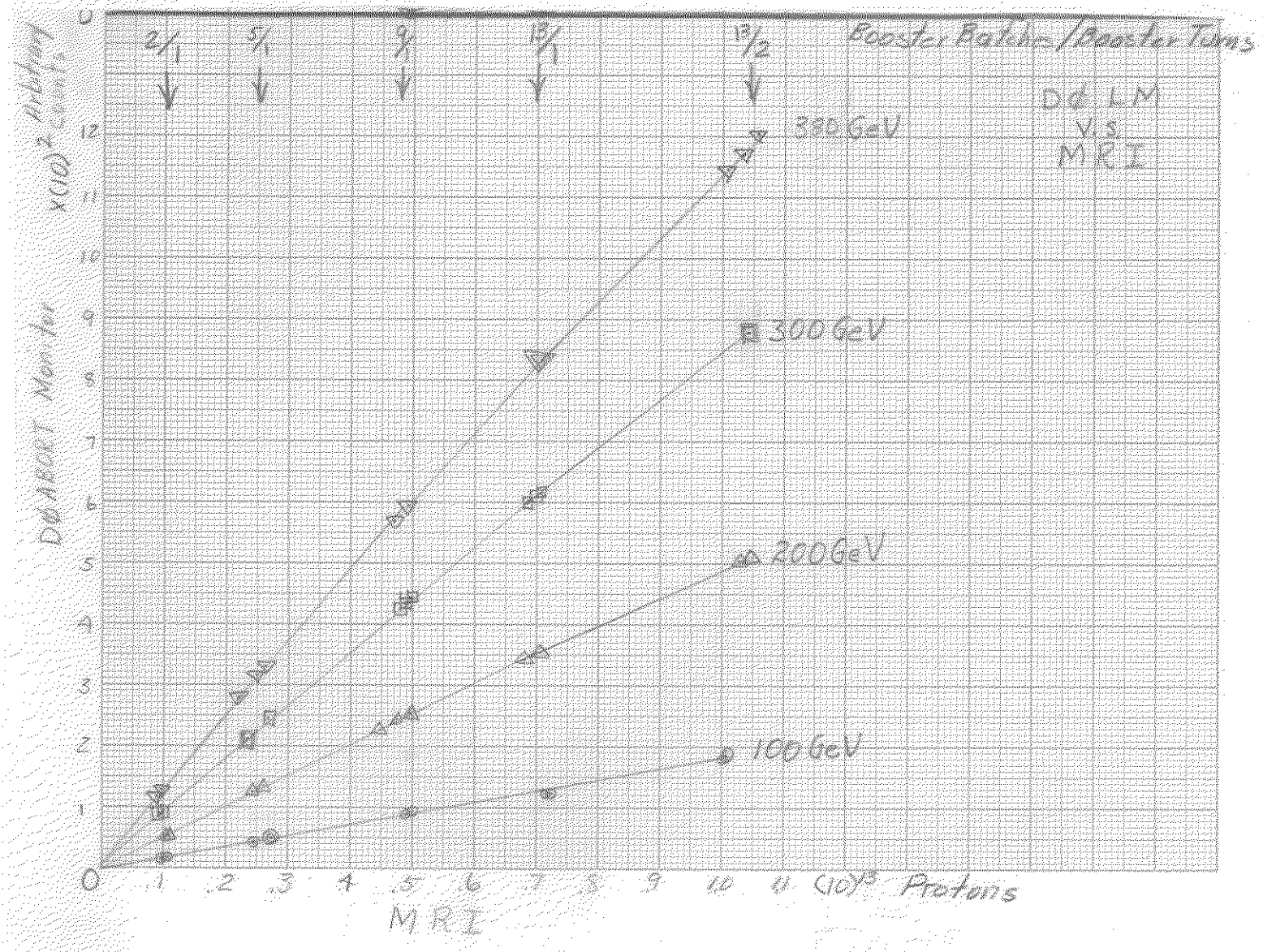
In any event, the effect is small, and for all practical purposes the abort monitor is calibrated. That calibration will be changed in the near future to make the counts represent an even multiple of $(10)^{10}$ 300 GeV equivalent protons.

Derived from graph 1, graph 3 shows the relationship of energy and the production of ionizing radiation at D0. For the reasons cited above, this curve is slightly flatter than it should be.

The cooperation of R. Stiening to make accelerator time conveniently available during good accelerator operation was appreciated and contributed to the success of the experiment.

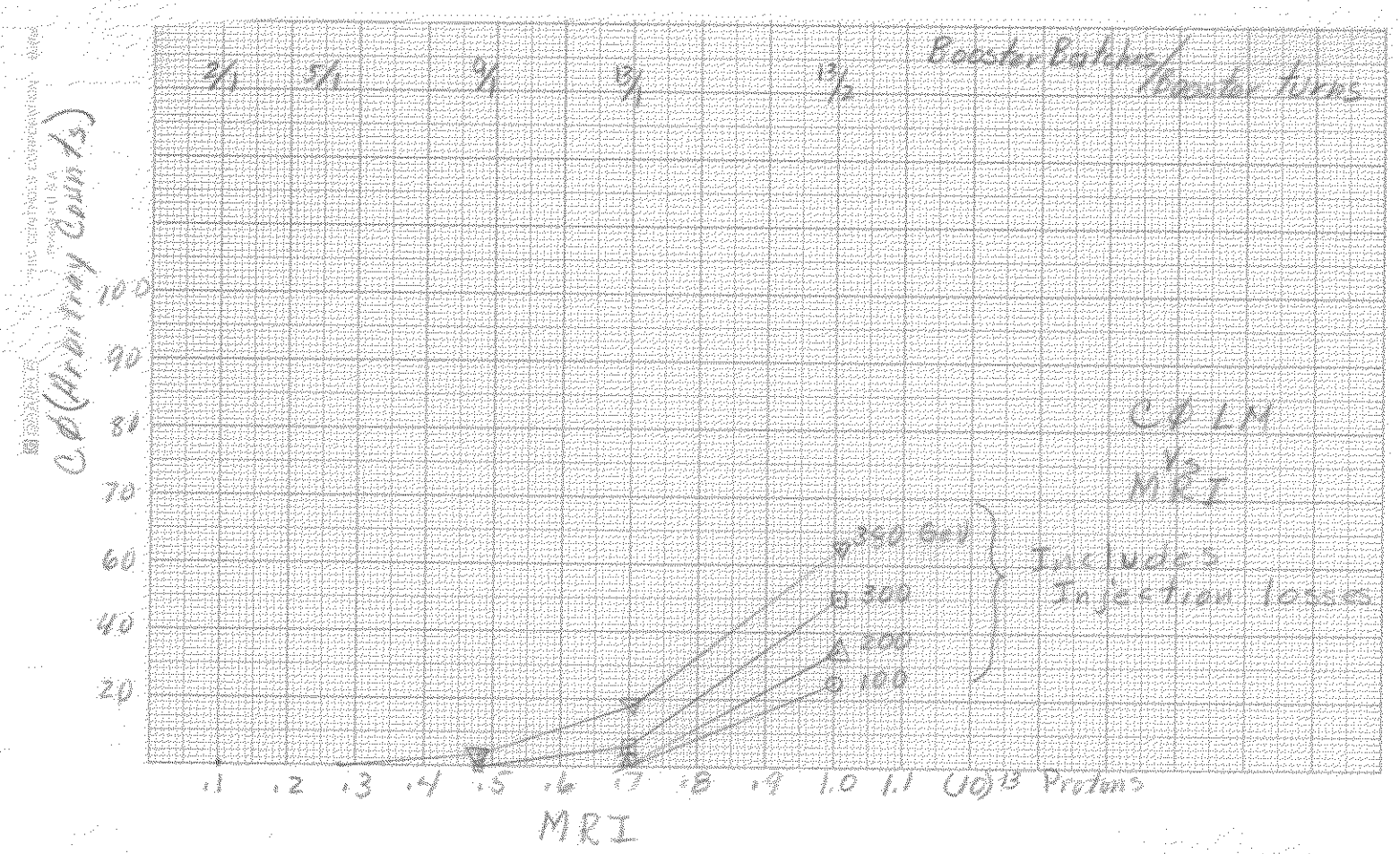
F. Hornstra

FH/emk
Attachments (3)



Booster Batches/Booster Turns
2/1
5/1
9/1
13/1
13/2
DØ LM
VS
MRI
380 GeV
300 GeV
200 GeV
100 GeV
DØ ABORT Monitor
x(10)² Arbitrary Counts
0
1
2
3
4
5
6
7
8
9
10
11
12
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1.1
(10)¹³ Protons
MRI

GRAPH 1



Booster Batches/Booster turns
2/1
5/1
9/1
13/1
13/2
CØ (Arbitrary Counts)
100
90
80
70
60
40
20
CØ LM
vs
MRI
350 GeV
300
200
100
Includes
Injection losses
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1.1
(10)13 Protons
MRI

GRAPH2

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